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RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
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VOL. XIII SEPTEMBER, 1919 No. 6

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XIII SEPTEMBER, 1919 No. 6

A REPORT OF THE WORK CARRIED OUT AT THE RADIUM INSTITUTE, LONDON.

From January 1st, 1918, to December 31st, 1918.*

By

A. E. HAYWARD PINCH, F.R.C.S.

Medical Superintendent

Fibroid Disease of the Uterus.

The menorrhagia and metrorrhagia, which are the usual concomitants of this condition, are almost invariably checked, sometimes completely abolished, by radium treatment. Some diminution in the size of the existing tumour may also be produced, but this result is not always obtained.

Prolonged exposures of thirty hours' duration are given, a 100-mgr. tube, screened with 2 mm. of lead and 3 mm. of rubber, being placed within the uterus—or in the posterior fornix if this be impracticable—supplemented with a plate of equal strength screened in similar fashion, and applied over the fundus.

In many instances one such series of exposures proves effective, in others two, three, or four series may need to be given at intervals of not less than four months.

The most suitable cases for treatment are those in which the patient is over forty years of age—so that the establishment of a premature menopause is not a matter of any very great moment—and the tumor is of moderate size, and not the site of any inflamamtory or degenerative changes.

*In this number of RADIUM is reprinted the concluding portion of the Report, the first part of which appeared in the August number. It must be borne in mind that in this Report the dosage is reported in terms of pure crystalline **radium bromide**, which is a salt containing 53.6 per cent. of radium element. Since radium element is the standard used in this country, it is necessary to multiply the figures given in the Report by the factor 0.536 in order to express results in terms of radium element.—Editor.

Case No. 2873, F., aged 48. This patient was first seen at the Institute on the 10th June, 1918. She stated that her periods had been quite regular, and the loss of normal amount until early in 1915, when the flow became profuse, and that since January, 1918, the periods had been rather irregular and the amount lost excessive, weakening her very greatly. She was examined by a leading gynæcologist, who told her she had uterine fibroids, but as she was averse from operation, suggested radium treatment.

When examined the uterus was found to be enlarged to the size of a tennis ball, irregular in outline from presence of multiple adenomata, and retroverted. It was quite freely movable. Patient was anæmic, languid and disinclined for any exertion. She received thirty hours' exposure with heavily-screened apapratus applied both intra-vaginally and over the abdominal wall. Her doctor wrote at the end of 1918 saying the result had been most successful. There had been amenorrhœa since July, the uterus was much reduced in size, and the patient was feeling well. The improvement has been maintained.

Chronic Metritis—Uterine Fibrosis.

This exceedingly obstinate condition, which so frequently defies all gynæcological measures short of removal of the uterus, often yields in a remarkable fashion to radium therapy. The metrorrhagia is cured, the menorrhagia lessened, and menstruation becomes normal in character.

Prolonged screened exposures of about thirty hours' duration are necessary, both intra-uterine and extra-uterine applications being employed.

In cases of long standing the exposures may have to be repeated three, four, or more times, a procedure which usually induces the premature establishment of the menopause.

In patients under forty-five years of age, the possibility of this occurrence should be made clear to them before the treatment is commenced.

Chronic Metritis—Case No. 2561, F., aged 45. The patient had suffered from severe menorrhagia for nine months. She had been curetted, but derived very little benefit from the procedure. The hæmorrhage was profuse, and was rendering the patient very anæmic, weak and languid. When first examined on the 23rd August, 1917, the uterus was found to be slightly and uniformly enlarged. It was freely movable, and no adenomata could be detected. There was a copious mucous discharge from the cervix.

She was given five days' treatment, an exposure of six hours' duration each day, a tube of 100 mgr. screened with 2 mm. of lead and 3 mm. of rubber being placed in the posterior vaginal fornix, and a plate of equal strength screened in similiar fashion applied over the fundus.

The metrorrhagia was arrested within three weeks of the treatment; the patient then had two periods of normal character and amount, and this was followed by amenorrhœa, which proved persistent. The cervical discharge was abolished. Patient rapidly regained her health, became of good color and increased in weight. She has since kept perfectly well.

Case No. 2869, F., aged 44. The patient married at the age of 22, and had never been pregnant. She had suffered from dysmenorrhæa since the aged of 19, her periods had always been somewhat profuse, and had lasted for four or five days. For the last ten years there had been definite menorrhagia. She had been treated by many gynæcologists, had been curetted twice, and also had division of the cervix carried out. In 1907

left oöphorectomy and in 1917 right oöphorectomy was performed, but in spite of this the menorrhagia persisted, and was considered to be due to the presence of an ovarian rest. Vaginal examination on the 6th June, 1918, revealed an elongated conical cervix, with a pin-hole os. The uterus was somewhat tethered and lateriverted to the left by post-operative adhesions. No actual fibromata could be defined, but the uterus was slightly and uniformly enlarged and left flappy to the touch.

The patient was a well-developed woman, but distinctly anæmic. She complained of an extremely profuse menstrual flow lasting for five or six days, and accompanied by severe dysmenorrhœa for the first two days.

She received thirty hours' exposure with a tube of 100 mgr. screened with 2 mm. of lead placed in the posterior vaginal fornix, supplemented with a plate of equal strength screened in similar fashion and applied over the fundus.

The patient wrote at the end of December, 1918, "I cannot tell you how grateful I am. I have had no period since my treatment, and the release from the torture I had every month for twenty-four years is wonderful."

She has remained perfectly well.

GOITRE.

Radium therapy is not to be advocated as a routine method of treatment for this condition, but in those cases where the usual medical treatment has failed to produce any benefit, and the patient has declined operation, it is worthy of a trial. The best results are to be anticipated in the simple parenchymatous type; growths of a definitely cystic character, or composed of multiple dense fibro-adenomata are but little, if at all, benefited.

Parenchymatous Goitre—Case No. 2517, F., aged 46. This patient was first seen on the 2nd July, 1917, the condition then being of seventeen years' duration, but it had become very much worse during the past eighteen months. Operative measures had been considered, but negatived as patient had a very weak heart and sufferd from frequent attacks of syncope. When examined, the whole thyroid was found to be enlarged, though not uniformly, there being a soft adenomatous mass 6 cm. in diameter in the right lobe, and another 4 cm. in diameter in the left one. The circumference of the neck was 39 cm.

The patient was well nourished and of good color. There was no exopthalmia, no tachycardia, and only a slight tremor on voluntary movement. She was troubled chiefly by the disfigurement of her appearance.

She received treatment in July and November, 1917, prolonged exposures with heavily-screened applicators being given. She was last examined in February, 1918; great improvement had resulted, the circumference of neck was only 35 cm., and only some slight prominence of the right lobe was visible. There were no tremor, no eye symptoms, she had gained weight and strength, and was better in every way.

Case No. 2326, M., aged 36. The patient was first seen on the 2nd January, 1917. He stated that his throat had been slowly but steadily increasing in circumference during the past two years.

When examined the thyroid gland was found to be uniformly enlarged, soft and vascular. The circumference of the neck was 43 cm.

The gland was not fixed, and moved readily with delutition. A loud systolic bruit was appreciable all over it on auscultation. The patient had no eye symptoms, no tremors, no tachycardia, no loss of flesh

or strength, and no disturbance of the sympathetic or recurrent laryngeal nerves.

He was treated from the 8th to the 12th January inclusive, receiving in all thirty hours' exposure with apparatus containing 250 mgr., screened with 2 mm. of lead and applied over and around the thyroid gland. He was next seen on the 26th February. Great improvement had resulted. The gland had shrunk considerably, and only the right lobe was in any degree conspicuous. The circumference of the neck was only 39 cm. The systolic brùit was no longer appreciable, and patient appeared in excellent health.

The improvement has since been maintained, and no further treatment has proved necessary.

War-Time Injuries

During the past five years many patients suffering from a great variety of war-time injuries have been sent to the Radium Institute for treatment. Some cases were of such character as to be manifestly unsuitable for radium therapy, *e.g.*, hernia cerebri, bony ankylosis of joints, etc.; but others such as keloids, vicious cicatrices, painful scars, arthritis of infective origin, fibrous adhesions, and periosteal sarcomata following injuries, have been taken for treatment. The exigencies of the Services have, however, prevented many of these cases from being followed to a successful termination, the patients either being transferred to some other hospital, or invalided out of the Services, and returned to their homes at a distant part of the country before their treatment was completed. These circumstances often rendered the results of the treatment of keloids and vicious cicatrices disappointing, as to secure the best effects prolonged exposures with silver screened apparatus need to be given at six weekly or two monthly intervals, over a period of one year or even longer. In those instances where the patients were able to comply with these requirements, the results were as a rule satisfactory.

A few cases of painful scars, due probably to the involvement of terminal nerve filaments in the scar tissue, were treated, but though many different forms of exposure and screening were tried, but very little relief was obtained.

Considerable caution had to be exercised when dealing with scars occupying an extensive area, or in close relationship with bony tissues, as in such lesions it was found that by reason of the greatly diminished blood supply, and impairment of the functions of the trophic nerves, vesication or superficial ulceration was very easily induced. Quarter-strength applicators were, therefore, always employed, and the length of the exposures curtailed. A few cases presented themselves for the treatment of scars, in the neighborhood of which fragments of shrapnel or metal remained embedded. The secondary radiation reflected from the surface of such bodies greatly intensified the reaction, and necessitated a proportionate diminution of the strength and duration of the exposures.

The effect of radium irradiation upon chronically inflamed tissues, which have some time previously been the site of acute septic changes, occasionally stimulated some dormant focus of bacterial infection, and in the treatment of such patients the possibility of this occurrence has always to be borne in mind.

When dealing with the limitation of movements of joints due to the presence of fibrous adhesions, the date at which the treatment commenced was found to be a factor of the greatest importance, as if the

patient attended before the fibrous tissues were fully organized, and had commenced to contract, the results were obtained much more rapidly, and proved more definite and permanent.

Gunshot Wound of Larnyx—Case No. 6939, M., aged 20. On the 23rd April, 1917, this patient was wounded by a sniper's bullet, which entered the right side of the neck, and passed forwards and downwards, making its exit at the lower border of the thyroid cartilage in the middle line. When he recovered consciousness he found he had no voice. He was taken to hospital, where he remained comfortable for a month, but his breathing became embarrassed and tracheotomy was performed on the 25th May.

In September, 1917, it was found that the trachea was almost completely blocked by scar tissue, the epiglottis, thyroid cartilage and right vocal cord being seriously damaged. In October an operation was performed, much of the scar tissue being removed, and the glottis was kept open by bougies. A fortnight later the patient found he could speak with a very hoarse voice, but he had to retain the tracheotomy tube.

In May, 1918, the scar of entry was smooth. The scar of exit was puckered and keloidal, and deep to it much induration could be felt. The laryngoscope showed a narrowing of upper part of larynx, due to displacement with adhesion of the epiglottis, the aperture being about the size of a French kidney-bean. The vocal cords could be seen only partly. The right cord was immobile, but the left was seen to move slightly on phonation.

Treatment was given in the second week of May and in the third week of June. By the end of July the induration was much reduced, the epiglottis was freed from its adhesions, and the cords could be seen clearly. The patient's voice was much improved.

Shell Wound of Larynx—Case No. 5915, M., aged 28. This patient was injured in the left side of the neck as the result of the explosion of a trench mortar in February, 1918. Healing of the wound was followed by persistent hoarseness. An examination in April, 1918, showed considerable infiltration deep to a conspicuous scar. The laryngoscope showed free movement of both vocal cords, but complete approximation did not occur, the arytenoid cartilages being separated by some conspicuous granulations, and the edge of the left cord was slightly wavy. Treatment was given in April, June and July. The external scar became softer and thinner; the infiltration gradually disappeared, the cords approximated more closely, and the patient's voice became almost normal.

Gunshot Wound of Thigh—Case No. 6863, M., aged 31. This patient was seen in February, 1918. He had several scars resulting from shrapnel wounds in the previous April, when he had sustained a compound fracture of the tibia and of the patella; the patella had been removed.

A curved linear scar 12 × 2 cm. crossed the lower end of the femur at level of upper margin of patella, and curved downwards and inwards. In the mid-line and at the inner extremity of this were two linear vertical scars, each of 4 × 2 cm., involving the tendon of the quadriceps, and adherent to the bone. The quadriceps muscle was partly wasted in its lower third; when the patient flexed his thigh to lift the foot off the ground the knee was flexed involuntarily through an angle of 14° by the weight of the leg. The patient complained of inability to flex the knee, of instability, and of pain in the scars.

The scars were rayed by tubes screened with 1 mm. of silver, ap-

plied for five hours on four successive days. A sharp reaction followed, with slight superficial vesication in two places.

Six weeks after the treatment the adhesions were released, and the patient could control the knee joint, which flexed better. His confidence in walking was returning rapidly, and he was free from pain. The military authorities sent him home to Yorkshire.

Gunshot Wound of Left Arm—Case No. 6917, M., aged 33. This patient received a revolver bullet wound through the front of the left arm in September, 1917. When seen in April, 1918, there was a V-shaped cicatrix 10 cm. in length on the front of the arm. The apex of the scar was firmly adherent to the biceps, and although flexion was good, voluntary extension beyond 154° was limited by severe pain. By passive movement the angle increased to 160°, the scar dragging on the skin and biceps. The patient had been treated by massage, electricity and baths for some months, but the condition had remained stationary.

From the 22nd to the 26th April inclusive the scar was rayed by two plates containing 145 mgr. screened with 1 mm. of silver applied for five hours on each of five days. By the 22nd May the arm could be extended completely with an effort and some pain.

The treatment was repeated for three days, and again in July for two days, and when the patient was last seen he could extend his arm quite painlessly to the normal degree.

Vicious Cicatrix of Thumb—Case No. 2611, F., aged 19, munition worker. The patient injured her right wrist, palm and thumb in a drilling machine on the 15th June, 1917. Severe contraction of the palmar and thumb fascia ensued, and a plastic operation was performed on the 6th August. 1917, but no permanent benefit resulted.

The girl was sent to the Radium Institute for treatment on the 15th October, 1917. When seen there was a scar—the joint result of the accident and the operation—running from the radial border of forearm 5 cm. above the wrist line, around the ball of the thumb on to its flexor surface, where it terminated at the inter-phalangeal joint. Throughout its whole length the scar was hypertrophic, hard and keloidal, but in the fold between the thumb and the forefinger there was, in addition, much deep induration and contraction which had flexed the thumb at its inter-phalangeal and metacarpo-phalangeal joints, dragging it downwards and inwards across the palm of the hand, and fixing it so firmly that it could not be extended or abducted. The movements of flexion and extension of the wrist were also much restricted.

The patient received treatment, first at intervals of two and then of three months, until July, 1918, half-strength applicators screened with 1 mm. of silver being employed, and exposures of eighteen hours' duration in all being given.

Improvement occurred at a steady and uniform rate, and when the patient was last examined in October, 1918, but little trace of her injury remained. All the keloidal and indurated tissues had disappeared, the scars were soft and supple, all movements of the wrist could be performed to their normal extent, the thumb was no longer bound down into the palm of the hand, and could be freely extended, though its abduction was not quite equal to that of the left hand.

The patient had been working full time at the munition factory since July.

Vicious Cicatrix (Left Thigh)—Case No. 6846, M., aged 43. In October, 1915, this man was wounded in the right shoulder by shrapnel. In January, 1916, a cellulitis in left thigh necessitated extensive deep

incisions, and the patient spent months in bed. Prolonged courses of varied treatment were given. In January, 1918, the patient had a central rectangular scar in the front of his left thigh which measured 5½ × 4 cm., and was movable. From the lower end of this, two long straight linear scars extended down obliquely inwards and outwards; these were fixed to the bone in part directly, and in part indirectly by means of inter-muscular septa. Between these scars the muscle was atrophied and the tissues were hard and insensitive. The upper part of the quadriceps acted on the outer aspect of both these scars, and had barely sufficient power to lift the heel from the ground when the patient sat on the edge of a chair.

Tubes of radium screened with 1 mm. of silver were laid along the sulci over the scars for ten hours, distributed over three days. A moderate reaction of hyperæmia occurred, with slight vesication. Six weeks later the scars were quite loose, the quadriceps had regained its mechanical action, and the patient could move the thigh freely in any direction.

Tuberculosis

Tuberculous Adenitis—In the earlier stages of this condition, before caseation has occurred and fluctuation is appreciable, radium treatment is often of great value, as it will occasion shrinking, and fibrosis of the affected glands, thus postponing or averting the employment of surgical measures.

Half-strength applicators screened with 1 mm. of silver are employed, the total exposure being of eighteen to twenty-four hours' duration, distributed over three or four days.

Tuberculosis of Skin (Lupus Vulgaris)—Cases of long standing which have proved non-amenable to Finsen light, X rays, CO_2 snow, scarification, caustics, etc., are sometimes quickly and effectively cured by radium, and the treatment is well worthy of a trial when other methods have failed. Definitely ulcerated areas should receive unscreened exposures of one to one and a half hour's duration, and a destructive reaction produced. A smooth, supple scar results.

The indurated and non-ulcerated areas are best treated with prolonged exposures, the apparatus being screened with 1 mm. of silver or 2 mm. of lead, the screening and exposures being varied in relation to the extent of the induration.

Lupus Vulgaris of Nose—Case No. 2806, F., aged 38. This patient was first seen on the 25th April, 1918. She had suffered from the disease for more than two years, and had been treated with tuberculin injections, scraping, sulphurous acid and various ointments without benefit. The lesion being situate on the nose caused considerable facial disfigurement. It was irregularly quadrangular in shape, with sides of 2 cm., superficially ulcerated, with much surrounding induration, which caused a very pronounced swelling. "Apple-jelly" nodules were visible on diascopy.

A half-strength apparatus was applied without screen for one hour, and five weeks later the ulceration had healed, leaving a smooth scar. The subjacent induration then received eighteen hours' treatment with half-strength apparatus screened with 1 mm. of silver.

When again examined two months later all signs of the trouble had gone, and the nose was quite normal in shape and appearance.

Lupus Vulgaris of Cheek—Case No. 2035, F., aged 65. The patient had suffered from the disease for seven years, and had been treated

with CO_2 snow, Finsen light, and various ointments, but the condition had proved most intractable.

She was first seen on the 23rd July, 1918. There was then an oval lesion 2.5 × 2 cm. at center of the left cheek. It was soft, brownish-red in color, and had undergone partial cicatrization at its center. Its borders were congested and covered with thin papery scales. "Apple-jelly" nodules were visible on diascopy.

An exposure of one and a half hour's duration was given with a half-strength applicator unscreened. This effected a great improvement, and when the patient was examined two months later only a small narrow patch at the outer border remained. This received a second and similar exposure, which was followed by complete and perfect healing of the lesion.

Lupus Vulgaris of Cheek—Case No. 2850, F., aged 37. The patient had suffered from lupus vulgaris of the face since infancy, and had received many treatments with Finsen light and X rays.

When first seen on the 28th May, 1918, the posterior half of left cheek showed an irregular scarred area resulting from previous treatments. Immediately in front of the attachment of the auricle was a quadrangular patch of lupus running vertically downwards, and measuring 4 × 1 cm. The patient stated that it was rapidly increasing in size. She received in all three treatments at intervals of two months, full-strength apparatus being used, unscreened for forty minutes.

By the end of the year no sign of the disease remained.

Lupus Vulgaris of Nose—Case No. 6621, M., aged 18. The disease began in infancy and had persisted without ever healing. When first seen the patient's nostrils were almost completely blocked by a dark red infiltration and thickening of the lower margin of each ala, which was superficially ulcerated. The tip of the nose was red and swollen. The skin of the upper lip was inflamed and on its right extremity was a scaly superficial ulcer 2 × 1 cm. in area, of a year's duration. The septum was perforated.

The patient was treated on four occasions at intervals of three to six months. Half-strength plates were applied, screened with 1/10 mm. of aluminum were passed into the nostrils and left for forty-five minutes. The reactions were fairly sharp, and continued for six weeks or more, the condition improving slowly and at last healing completely. The patient was passed into the army in class A1.

Tuberculous Sinus of Arm—Case No. 6941, F., aged 25. This patient was first seen on the 8th May, 1918. She stated that a tuberculous abscess developed just above the inner condyle of her right arm in December, 1917. It was excised and evacuated, but a small sinus had persisted, and there was a constant slight purulent discharge. The patient had never shown any previous symptoms of tuberculosis, though she had a typical strumous appearance, and there was a family history of phthisis. A 25-mgr. tube was inserted into the sinus for one hour, no screening other than that afforded by the glass wall of the tube being employed. The treatment was repeated eight weeks later, the exposure being increased to one and a quarter hours.

Patient reported herself early in August. The sinus had closed completely and firmly. There was no discharge, swelling, pain or tenderness.

She has since kept perfectly well.

Leukoplakia

Leukoplakia, whether of the mouth or vulva, is almost always much benefited by radium, and the pruritus which is so general a symptom in the latter situation is greatly relieved. The condition, however, exhibits a strong tendency to recurrence, more especially when the patient has suffered from specific disease.

The screening employed, and the length of exposures, have to be varied in accordance with the character of the lesion—thin and glazed, thick and opaque, ulcerated and fissured. In the early stages screening of 1/10 mm. of lead is employed, and exposures of one to two hours' duration given; in the later stages the screening is altered to 1 mm. of silver, and the exposures are of from six to eighteen hours over two or three successive days.

Leukoplakia of Tongue—Case No. 2836, M., aged 50. This patient contracted syphilis in 1890. In 1899 he had a specific glossitis which yielded to treatment, and in 1907 tertiary nodules on both tibiæ, for which he received salvarsan injections. In 1912 leukoplakic patches first appeared on the tongue, and in 1915 one of them on the right border of the tongue became definitely epitheliomatous, and the right half of the tongue was therefore excised in July, 1915. At the end of 1917 leukoplakia of the left half of the tongue appeared and became very troublesome. Patient disliked the idea of further operation, and radium treatment was suggested.

When first examined on the 22nd May, 1918, there was an extensive thick, rough, pearly-white leukoplakic patch on the left half of the tongue, extending from the circumvallate papillæ to tip. Near its center was a hard prominent warty nodule the size of a large pea, which was tender on pressure. No lymphatic involvement was appreciable. The patient received two hours' exposure with a half-strength applicator screened with 1/10 mm. of lead.

Six weeks later the warty nodule had disappeared, and only a few small scattered leukoplakic patches remained. The treatment was repeated, and the condition cleared up completely.

No further exposures have been required.

Leukoplakia of Mouth—Case No. 6860, M., aged 50. This patient had always been a very heavy smoker, but had never suffered from syphilis. The condition had existed for two years, and was steadily becoming worse and more extensive in spite of all treatment.

When first examined on the 18th February, 1919, the disease was found to be confined to the buccal folds of mucous membrane between the upper and lower jaws. On the right side there was a thick opaque white patch—looking like a piece of white kid glove—triangular in shape, with base forwards, and measuring 4 × 2 cm. On the left side the condition affected the same area, but its distribution and thickness were irregular and uneven. The patient received three treatments in February, March and April at intervals of three weeks. On the two first occasions full-strength applicators screened with 1/10 mm. of lead were used, and an exposure of one and a half hour's duration given. On the last occasion the same apparatus was employed, but the screening altered to 1 mm. of silver, and the exposure lengthened to six hours.

The patient reported himself at the end of April. All the patches had disappeared, leaving smooth healthy mucous membrane.

No further treatment has been required.

Chronic Ulcerations

Cases of persistent chronic ulceration which have proved resistant

to all routine treatment, and the etiology of which is obscure, are met with occasionally, and their cure may usually be effected. An applicator rather larger than the lesion is employed, and an exposure of one to two hours' duration given unscreened. This produces a sharp destructive reaction, followed by the formation of a crust. Gradual healing takes place under this crust, which falls off in six or seven weeks' time, leaving a supple, inconspicuous scar.

Chronic Ulcer of Breast—Case No. 2257, F., aged 39. The ulceration had existed for six years, and had defied all treatment, it had been thoroughly scraped and cauterized, but had made no attempt at healing.

When first seen on the 12th of October, 1910, a soft granulomatous rosette-shaped lesion was present on the lower and inner quadrant of the right breast. It measured 1.5 cm. in diameter, was bright pink in color, and superficially ulcerated. Its borders were sharply defined, but there was no rolled edge or subjacent induration. It was not very painful, but distinctly tender, and the site of much itching.

A full-strength applicator was applied without screen for one hour and twenty minutes. There was a sharp reaction, accompanied by crust formation, and the scab separated five weeks after the exposure, leaving a smooth, supple and scarcely noticeable scar. There has been no recurrence.

Chronic Ulcer of Forehead—Case No. 2341, F., aged 54. This patient had an attack of seborrhœic eczema, affecting the left side of the fact, in October, 1915. The greater part of the eruption healed under appropriate treatment, but the lesions above the outer extremity of the left eyebrow proved intractable, and ultimately an ulcer formed in this situation, and steadily increased in size. The patient consulted many dermatologists, and various opinions had been given as to the nature of the ulcer, tuberculous, gummatous, rodent, artifact, etc. Specific treatment was employed for a period of six months without effect. Many lotions and ointments had been tried, but all proved futile.

The case was first seen on the 17th January, 1917. There was then an oval ulcer measuring 4 × 2.8 cm., situate immediately above the outer half of the left eyebrow. Its edges were definitely raised, denuded of epithelium, but smooth and not hard. The base of the ulcer was covered by a firmly-adherent blackish slough—resembling that due to the action of an escharotic. The ulcer could be moved freely over the underlying tissues. It was somewhat tender to the touch, but not really painful. There was no surrounding zone of erythema or induration. The pre-auricular gland was not affected.

The patient received fifteen hours' exposure, five hours each day, the 23rd, 24th and 25th of January, with a plate containing 40 mgr. screened with 1/10 mm. of lead. This treatment was followed by a moderate reaction, and when this subsided the ulcer began to heal, but at a very slow rate. At the end of May the patient's doctor reported that the healing was complete—a thin, pale and depressed scar occupying the site of the ulceration.

Naevi

The radium treatment of cavernous nævi may be regarded as most satisfactory, and though the procedure is a somewhat lengthy one, screened exposures having to be given at six weekly intervals for six, nine, twelve, or more months, the result is always superior to that which could be obtained by any other measures. On the other hand, capillary nævi are not so favorably influenced, and though the removal of a small capillary nævus may quickly be brought about by the employment of a

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destructive reaction of moderate degree, this method is not practicable in the case of large and widely distributed port wine stains by reason of the extensive scarring which would result. It is, however, often possible to reduce the tint of these lesions to a pale salmon-pink color, which is easily concealed by a slight covering of face powder.

Much care and experience are, however, needed for the successful treatment of these cases. The factor of personal idiosyncracy is always a very pronounced one, and there is a great tendency to the appearance of telangiectases in the treated areas, which require to be destroyed with the electric cautery so soon as they develop.

Keloids and Vicious Cicatrices

Radium rapidly produces great and permanent improvement in these conditions, especially when they have not existed for any length of time, and occur in young subjects.

The routine treatment consists in exposures of eighteen to twenty-four hours' duration with half-strength applicators, screened with 1 mm. of silver, the series being repeated at intervals of about six weeks.

A gradual, but steady, absorption of the keloidal or fibrous tissues occurs, and there is but little, if any, surface reaction. The tenderness and itching of the keloidal tissues if present usually disappears within a fortnight of the first treatment.

Keloid of Neck—Case No. 2798, F., aged 18. This patient had a tubercular gland excised from the right side of her neck in 1913.

The scar became keloidal and was excised in 1916, but a second keloid rapidly developed. It was treated with X rays, and injections of fibro-lysin, but without effect.

When first examined on the 19th April, 1918, there was a "spear head" shaped keloid, 6 × 1.5 cm., extending from the angle of the right jaw to the lower border of the thyroid cartilage. It was prominent, bright red, indurated and tender.

The patient received five series of exposures, each of eighteen hours' duration, with half-strength apparatus screened with 1 mm. of silver. The lesion completely disappeared, only the faint track of the operation incision remaining apparent.

Dupuytren's Contraction—Case No. 2192, M., aged 35, engineer. This patient was first seen on the 7th August, 1916. He stated that the condition had appeared at the commencement of that year, and had developed very rapidly, causing flexion of the little and ring fingers of the right hand, and seriously interfering with his work.

An attempt was made to improve the condition by operation on the 1st June, but proved useless, and the disease extended and commenced to implicate the first and second fingers also.

When examined on the 7th of August, there was extreme flexion of limitation of extension of the first and second ones. A hard, dense fibrous mass was present in the palm over the heads of 3rd, 4th and 5th metacarpal bones, and from its distal border prolongations of the palmar fascia could be felt passing to the first inter-phalangeal joints.

The patient was given eighteen hours' exposure with flat applicators containing 120 mgr. of radium, screened with 1 mm. of silver. Some slight vesication over the area treated occurred a fortnight later, but speedily healed, and steady improvement followed. He was last seen on the 16th December, 1918. All that remained was some very slight limitation of extension of his ring finger, which in no way troubled him.

Warts, Papillomata and Granulomata

Radium is of the greatest possible use in effecting the removal of warts from situations where excision, or the employment of powerful caustics, is to be deprecated, *e.g.*, the eyelids, lips, urethra, penis and labia.

Unscreened exposures of one to one and a half hour's duration with full-strength applicators should be given, and if the exposure be correctly estimated, an almost painless exfoliation of the wart takes place in about a month's time, there being little or no tendency to recurrence.

Senile keratoma may be treated in similar fashion with equally good results.

Moles, especially if pigmented, are not suitable lesions for radium therapy, and should be left severely alone. If the patient be insistent upon their removal, free and wide excision by a surgeon should be advised.

Warts of Lip—Case No. 2593, M., aged 56. The condition was of six years' duration. A large wart situated at the center of the lip had been excised in 1914, but the trouble had speedily recurred.

When examined on the 2nd October, 1917, the whole of the mucous surface of the lower lip was occupied by a warty growth. The right half was flattened, sessile and only slightly papilliferous; at the left half the growth was exuberant, papillated and pedunculated, it bled freely when handled, and occasioned the patient much discomfort whilst eating. No glandular involvement was appreciable.

An exposure of one hour and a quarter's duration was given with a half-strength applicator unscreened. This produced a fairly severe reaction, but in two months very little of the growth other than some fine velvety papillation remained. On the 5th December the treatment was repeated, but the exposure shortened to fifty minutes.

The patient was not seen again until the 16th April, 1918. He stated that the treatment which he received in December resulted in the complete disappearance of the lesion, but that early in March a fresh wart had appeared on the right side of the lip, and had grown very rapidly. Examination showed a circular exuberant ulcerated growth, 1.3 cm. in diameter, to right of middle line of lip, its edges were hard and everted, and there was much subjacent induration, its general appearance being strongly suggestive of epithelioma. No enlarged glands could be felt.

The patient received one and a half hours' exposure with a full-strength applicator unscreened. He reported himself five weeks later. The growth was much reduced both in diameter and thickness, and was less indurated. The same apparatus was again applied for one and a quarter hours. By the end of July complete healing had taken place. There has been no recurrence.

Wart on Lip—Case No. 6963, M., aged 45. This patient had a small warty growth excised from the middle of the muco-cutaneous margin of lower lip in 1893. It recurred and was excised again in 1899. It reappeared in 1913, and had persisted ever since, without any appreciable change, as a slightly raised hard placque, involving both the skin and the mucous membrane of the lip. Posterior to this was a white patch, with a raised dark red prominence at its border, where the lip touched the margins of the incisor teeth.

There was a row of milium bodies of Fordyce's disease along the margin of the lower lip.

On the 6th June, 1918, a full-strength plate, containing 40 mgrs., was applied to the surface of the lip for twenty-five minutes. A very

small apparatus was then placed on the placque for twenty minutes. On the 18th July nothing remained but a minute hard mass at the lip margin. A small plate was held on for thirty-five minutes and the condition cleared up completely.

Wart of Lower Lip (Mucous Membrane)—Case No. 2884, M., aged 54. The patient had been a heavy smoker, and suffered from syphilis. Wasserman's reaction was positive.

There were numerous leukoplakic patches on the buccal mucous membrane. A soft pedunculated papilliferous wart, circular in shape, and 1 cm. in diameter, was present at the center of mucous membrane of lower lip close to its mucocutaneous margin. There was no subjacent induration and no lymphatic involvement. He received two treatments on the 23rd April and the 31st May, 1918, a full-strength apparatus being applied without screen for one and a quarter hours each time.

The wart completely disappeared three weeks after the second application and has not recurred.

Wart of Eyelid—Case No. 2852, M., aged 56. The patient had had a wart at the center of his left lower eyelid for seven years, but it had recently commenced to grow rapidly, and implicated the muco-cutaneous margin, causing much irritation of the eye.

On the 28th May, 1918, a circular applicator, containing 10 mgr. of radium was applied without screen for one hour. The wart fell off four weeks later. There has been no recurrence.

Warts of Corona Glandis—Case No. 3065, M., aged 26. The condition was of six months' duration, and had probably resulted from auto-inoculation, as the patient' had warts on his fingers. There was no history of gonorrhœa.

When examined on the 25th October, 1918, two flat sessile warts, each measuring 1.5×0.4 cm., were present on the edge of the corona glandis, one on either side of the frænum, which separated their contiguous extremities.

A full-strength apparatus was applied, without screen, for one hour and fifteen minutes. This produced exfoliation of the greater portion of the warts in about four weeks, when the treatment was repeated to the parts that remained. A month later all trace of the lesion had disappeared. Patient stated that the reaction was extremely mild, and occasioned him no discomfort at any time.

Warts of Urethra—Case No. 2419, M., aged 25. The patient contracted syphilis in October, 1916, and was effectively treated with "606" and neo-salvarsan. In February, 1917, some warts appeared around the urethral orifice and steadily grew.

When first seen on the 17th April, 1917, there was a crop of soft prominent warts immediately encircling the urinary meatus, and occupying an area of 1×0.6 cm. There was also a granular warty condition extending for a distance of 1 cm. within the urethra.

Full-strength unscreened applicators were used, an exposure of fifty minutes' duration being given to the external and forty minutes' to the internal growths.

A complete cure was effected within a month, and there was no recurrence.

Papilloma of Foot—Case No. 2349, F., aged 30. The disease was of two years' duration, and had been treated by many chiropodists, but without benefit.

When examined on the 20th January, 1917, there was a hard conical circular papilloma, 1 cm. in diameter, on the sole of the left foot at base of the flexure between the great and first toes. It was tender and

acutely painful on pressure, so that patient was unable to walk properly.

A full-strength apparatus was applied without screen for an hour and a quarter. Six weeks later the growth was found to be much reduced in size, all pain and tenderness had disappeared, and the patient could walk easily and well.

The exposure was repeated and a complete cure obtained.

There has been no further trouble.

Granuloma of Face—Case No. 3049, F., aged 54. The patient presented herself on the 15th October, 1918, for the treatment of a circular soft vascular growth 0.8 cm. in diameter, situated on the left cheek just over the infra-orbital foramen. It was superficially ulcerated, and covered with an adherent scab. It was quite freely movable, and there was no circumjacent or subjacent induration.

It was first noticed two months previously, and had grown rapidly. A full-strength apparatus was used, and an unscreened exposure of one and a half hour's duration given. A second and similar exposure was given eight weeks later.

Her medical man reported two months later that no trace of the growth remained.

Keratoma of Forehead—Case No. 6874, F., aged 56. An oval, dark brown, raised, sessile keratoma, measuring 2.5 × 1.5 cm., situate on the left side of forehead close to the hairy scalp. It had existed for three years. No treatment had been adopted beyond the application of sulphur ointment.

An exposure of one hour and fifteen minutes' duration was given with a half-strength applicator unscreened. The lesion slowly exfoliated, leaving smooth normal skin underneath.

When examined six weeks later it was difficult to detect the site at which the lesion had existed.

Senile Keratoma—Case No. 2855, F., aged 84. This patient presented herself on the 30th May, 1918, for the treatment of three dark brown flattened keratomata on the forehead and right side of face, which had existed for three years and caused considerable disfigurement.

Full-strength applicators of appropriate size were applied without screen for one hour and twenty minutes. Exfoliation of the patches commenced about three weeks after the exposure, and a month later no sign of any of the lesions remained.

Skin Diseases

Many kinds of skin disease are favorably influenced by radium irradiation.

The character of the treatment to be adopted varies within very wide limits, but, speaking in general terms, it may be said that when the disease is confined to the epidermis, *e.g.*, eczema, psoriasis, lichenification, etc., the best results are usually obtained by short unscreened exposures of from three to five minutes' duration on each of three successive days, or one such exposure of ten to fifteen minutes' duration, the former method being preferable.

When infiltration of the corium or deeper tissues is present, *e.g.*, xanthoma, mycosis fungoides, the later stages of xerodermia pigmentosum, fibroma, etc., longer unscreened or prolonged screened exposures are indicated.

Chronic Eczema—Case No. 2688, F., aged 37. The condition had existed for one year, and had not responded to the ordinary methods of treatment. The lesions were intensely irritable, and worried the pa-

tient greatly, both day and night. When first seen on the 14th January, 1918, there was a bright pink glazed oval area, measuring 4 × 2 cm., at the apex of the left axilla, its margins were very sharply defined, and two shallow slightly-ulcerated fissures traversed it in its long diameter. Numerous discrete spots, possessing similar characters, were present in the right axilla, and over the right pectoral fold. The patient received treatment on the 17th January and the 5th February, half-strength apparatus screened with 1/100 mm. of aluminum being applied for fifteen minutes.

By the end of February all signs of the trouble had disappeared, and there was no longer any irritation.

There has been no recurrence.

Seborrhoeic Eczema—Case No. 2720, M., aged 40. This patient had suffered from the disease for two years, and it had proved most intractable, defying all treatments. He was first seen on the 11th February, 1918. Two perfectly typical patches were present, one on the forehead and the other on the nape of the neck, both being situate close to the hairy margin of the scalp.

Half-strength applicators were used and an exposure of sixteen minutes' duration given without screen. These exposures produced a very great improvement, and were repeated four weeks later.

The lesions completely disappeared and have not recurred.

Lichen Annularis—Case No. 2684, F., aged 46.—The patient was first seen on the 10th January, 1918. She stated that the disease first appeared three years previously as a small ringed patch just above the left ankle. No treatment had proved of any avail, and the condition had slowly spread. The itching varied much in intensity, and was usually worse at nights, sometimes being so intolerable as to prevent any sleep.

When examined, numerous annular, or gyrate, patches were found to be present on the extensor surfaces of both legs and ankles. The individual papules were of a lilac color, and horny plugs were present at the mouths of many of the hair follicles. A brownish pigmentation of the skin was present at some spots where the disease had previously existed.

The patient was treated four times, the 11th and 24th January, the 12th February, and the 5th March. Half-strength applicators, screened with 1/100 mm. of aluminum, were used, and exposures of fifteen minutes' duration given.

Relief from the itching was obtained within a few days of the first exposure, the condition steadily improved, and by the end of March the skin of both legs was quite normal in appearance, and the patient expressed herself as feeling perfectly well.

Lichenification—Case No. 2370, M., aged 56. This patient was first seen at the Institute on the 23rd February, 1917. The condition had then existed for twenty years. It had been treated with Zam Buk and other patent remedies, but without effect. When examined, a triangular patch of perfectly typical lichenification, 8 × 5 cm., was present on the right buttock. The itching was very severe, and the patient often scratched himself unconsciously when asleep.

He received in all three treatments, on the 23rd February, the 9th March, and the 23rd March. A plate containing 80 mgr. was applied without screen for fifteen minutes on the last one. Definite improvement followed each application, and by the middle of April the lesion had quite disappeared.

Fordyce's Disease—Case No. 1830, M., aged 33. The disease had

existed for rather more than a year before the patient's first visit to the Institute.

Many treatments had been tried, but all had proved useless. The condition was of very extensive distribution, affecting the whole mucous membrane of both lips, which were irregularly subdivided into numerous slightly raised areas, very thickly studded with minute yellow milium bodies. There was considerable soreness, and a constant dry flaky secretion.

Half strength applicators, screened with 1 mm. of silver, were first used, but without producing any appreciable benefit. The screening was then altered to 1/100 mm. of aluminum, and exposures of fifteen minutes' duration given. Three such applications in all were made at intervals of four weeks.

Improvement was steady and uninterrupted, and six weeks after the last treatment was given the appearance of the mucous membrane was normal, no milium bodies were visible, the soreness and discomfort had ceased, the patient was no longer troubled by the accumulation of secretion.

The disease has not recurred.

Fordyce's Disease—Case No. 2161, M., aged 32. The patient was first seen in July, 1916, the disease being of eight months' duration.

The condition affected the mucous membrane of the upper lip, at the center of which there was an oval area, 2 × 0.3 cm., of closely aggregated yellowish milium bodies. No treatment had been adopted. The patient complained of a feeling of stiffness in and occasional itching of the affected part.

A full-strength apparatus, screened with 1/100 mm. of aluminum, was used, and an exposure of twenty-five minutes' duration given. This was followed by a fairly sharp reaction, with definite crust formation, lasting for nearly three weeks.

The patient was examined three months later. The greater part of the affected area had cleared up, leaving only a single row of milium bodies, 1 cm. in length, a little to the left of the middle line. The treatment was repeated, but the exposure shortened to twenty minutes. This effectively cleared away all trace of the disease, leaving a normal mucous membrane.

Xanthoma Palpebrarum—Case No. 2748, F., aged 34. The disease first appeared in September 1916, the neighborhood of the left inner canthus being affected. The patch was excised in February, 1917, but recurred four months later, and the right inner canthus also became affected.

When seen on the 8th March, 1918, two perfectly typical wash-leather colored patches were present, surrounding the inner canthi. Appropriate sized full-strength apparatus were applied without screen for fifty minutes.

The patient reported herself for examination seven weeks later. There had been a definite but not severe reaction, which had completely removed the lesions, leaving the skin quite normal in appearance.

Xanthoma Palpebrarum—Case No. 6610, F., aged 38. The condition had existed for four years and had recurred after excision. There were two irregular placques in the skin close to the canthus at either side.

A small full-strength apparatus was applied without screen for fifty minutes to the upper part first at one side then at the other. In six weeks' time the areas treated were normal in appearance. The lower

parts, which were slightly thicker, were then treated with the same apparatus for an hour, and when the patient was seen subsequently there was no sign of the yellow patches remaining.

Xeroderma Pigmentosum—Case No. 7004, M., aged 26. The patient, who came from the Argentine, was the child of first cousins. There were four other children, all of whom, except the eldest, suffered from the disease.

The condition first appeared when the patient was eighteen years of age, and developed very rapidly, affecting the whole of the face and the dorsal surfaces of the hands. In July, 1916, a warty growth was excised from the left upper lip; and in May, 1917, and September, 1917, two others were excised from the left side of the nose. In June, 1918, two fresh growths appeared on the right cheek and left lower eyelid, and the patient being anxious to avoid further operation, radium treatment was suggested.

When examined on the 19th July, 1918, the condition was quite typical, the skin of all the exposed parts of the face being thickly covered with blackish-brown freckles, many of which were cornified and palpable. In some places these hyperkeratosed papules had fallen out, leaving depressed scars resembling those of varioliform acne. There were two definitely hard warty growths 1 cm. in diameter, one situate over angle of right jaw and the other near the center of the left lower eyelid at muco-cutaneous margin. An hour's exposure with a full-strength applicator was given, and the growths completely disappeared within five weeks.

The patient presented himself again in September for the treatment of two similar growths which had recently appeared on the right side of his nose. The same treatment was adopted with equally good results.

Xeroderma Pigmentosum—Case No. 6510, M., aged 19. The patient, who was a Canadian, stated that the disease first made its appearance when he was seven years of age. There was no history of parental consanguinity.

The condition was confined to the exposed parts of the face—the hands, arms and legs never having been affected. Numerous growths had been excised from the diseased area from time to time, but the true nature of his trouble was not recognized until he came to England in September, 1916, and was referred to the Radium Institute. He was first seen on the 11th October, 1916. The skin of his face was dotted over with sparsely-distributed large blackish-brown freckles, the majority of which were indurated and palpable. There were eight definite, hard, conical, warty growths, averaging 1 cm. in diameter, situate on the lips, nose, cheek and ears.

The patient received two treatments: on the first occasion five, and on the second three, of the growths being radiated. Full-strength applicators were used without screen, and the length of the exposures varied from one to one and a half hours according to the thickness of the lesion.

Within six weeks of the exposure all the growths had disappeared, and the patient shortly afterwards returned to Canada.

Mycosis Fungoides—Case No. 2807, M., aged 46. The patient had suffered from the disease for four years. Its nature had been determined by a biopsy. The condition was of fairly wide distribution, affecting the buttocks, thighs, axillæ, upper arms, neck and scalp. The lesions in these situations had been treated with X rays, to which they had re-

sponded satisfactorily. The disease had recently attacked the tonsils and tongue, and it being difficult to apply X rays in these situations, radium treatment was suggested.

When first examined on the 28th June, 1918, the right tonsil was found to be slightly enlarged and œdematous. The lower two-thirds of its internal surface were ulcerated and covered by a yellowish crust. There was a distinct zone of congestion surrounding it, and the whole area was extremely tender when touched. A small purplish, flattened, non-ulcerated nodule was present in the contiguous portion of the base of the tongue. The left tonsil was enlarged and œdematous, but not ulcerated. The investing mucous membrane was glazed and gelatinous-like in appearance, and transversed by conspicuous dilated veins. The patient's general health was fairly good, he suffered but little pain, and showed no signs of cachexia.

On the 1st July, 1918, a full-strength apparatus was applied without screen for fifty minutes to the right, and forty-five minutes to the left, tonsil.

He was next seen on the 28th August, 1918. The right tonsil had cleared up and appeared normal. The left tonsil was a little smaller, and still non-ulcerated, but a small pyramidal fleshy nodule had appeared on the free border of left soft palate close to the tonsil. There was a large red oval sessile mass 6×2.5 cm. on the posterior half of the right side of the dorsum of the tongue. Its upper surface was slightly ulcerated, and it was very tender. Both these nodules, and subsequently the tonsils, were treated by the burying of powerful emanation tubes screened with 0.3 mm. of platinum for periods of five or six hours, and in every instance a satisfactory response was obtained. The patient still remains under treatment, as fresh manifestations of the disease occur from time to time.

Melanoma—Case No. 7025, F., aged 38. This patient had a black pigmented mole on her right cheek and side of neck from infancy. In December, 1917, she noticed a small warty growth on the dark skin in front of the ear. This bled occasionally when rubbed, and increased in size.

In August, 1918, there were two raised confluent nodules in front of the ear, occupying an area of 2.5×1.1 cm., almost quite black in color and movable with the skin, but infiltrated round the margins. On the posterior aspect of the ear was a black raised placque 1.5×1.3 cm. A full-strength plate was applied unscreened to the raised growth for two hours, and a sharp reaction followed. Six weeks later the same plate, screened with 0.2 mm. of silver, was applied for three hours. Subsequently a small unscreened plate was applied to one or other of the nodules for from forty minutes to one and a half hours on each of five occasions. When the patient was last seen the whole area was perfectly smooth. Some minute glands which were detected in the neck and axillæ are being kept under observation, but have not shown any increase in size.

Exophthalmic Goitre

The milder forms of this disease unassociated with diarrhœa, vomiting, rapid wasting, and extreme nervous exhaustion, do well under radium treatment, either alone, or as an adjunct to the usual medical measures.

Prolonged screened exposures should be given, but it is advisable to proceed cautiously at first, and not use too large an amount of radium, keeping the patient under careful observation for the first few months.

Not infrequently the immediate effects of the treatment are to increase the influx of thyroid secretion into the blood stream, thus producing a marked exacerbation of all the symptoms. In such cases it is advisable to decrease the amount of radium employed and the length of the exposures, and give smaller doses at more frequent intervals.

Case No. 2790, F., aged 51. This patient was much overworked during 1916 and the early part of 1917. In March, 1917, nervous symptoms appeared which were at first ascribed to neurasthenia, but later found to be due to Graves' disease. She was subjected to the usual medical treatment for this complaint, but did not derive any benefit, and was obliged to relinquish her work.

The patient came to the Institute in April, 1918. She was a spare woman of poor physique. There was a slight degree of uniform enlargement of the thyroid gland. Exophthalmos was present, but not to any great degree. Pulse rate 136. There was a coarse tremor of the limbs perceptible when the patient was at rest, and much aggravated by voluntary movements. The patient suffered from morning diarrhœa, and had lost seven pounds in weight during the past twelve months. She was not irritable, but restless, depressed, emotional and lachrymose.

She was given prolonged exposures with heavily-screened applicators, and left London at the end of April.

Improvement was very rapid and remarkable. All symptoms had disappeared within three months of the treatment, the patient regaining her normal health and being able to resume work.

No further exposures have been necessary.

Case No. 2787, F., aged 51. The patient came to the Institute in April, 1918, the disease then being of eight months' duration, and having failed to respond to the usual medical treatment.

Examination showed a moderate degree of uniform enlargement of the thyroid gland. The circumference of the neck was 34 cm. Proptosis was noticeable, but not extreme. Both Von Graefe's and Stellwag's signs were present. Pulse rate 112. Heart sounds clear; the second aortic was a little accentuated. There was a fine tremor of hands, which became much worse on voluntary movement. No vomiting, no diarrhœa.

The patient was not irritable, but confessed to a feeling of restlessness, was easily excited, and lacked power of concentration. She received two courses of treatment in April and September, 1918. When last examined great improvement was apparent. The thyroid was much diminished, the circumference of neck only 32 cm. No proptosis. Pulse rate 86. Tremor of hands scarcely noticeable. The patient was no longer restless or excitable. She slept well, was able to concentrate on her work, and was putting on flesh.

Arthritis Deformans

The daily administration of 250 cc. of radium emanation solution of a strength not less than 1.5 millicuries per litre, continues to give excellent results in selected cases of this disease. The patients who are most favorably influenced are those in whom fibrous, as distinct from osseous, changes are predominant, and in which the condition is infective, rather than traumatic in origin.

Cases of long standing with bony ankylosis, osteophytic formation, or ulceration of interarticular cartilages derive but little benefit beyond possible relief of pain.

Much research has still to be undertaken to determine the exact action of radium emanation on the body tissues, but clinical experience

suggests that reinforcement of the action of the body ferments, increase of katabolic changes generally, and the furtherance of the transformations of proteids into urea are factors which contribute to its success.

Case No. 2335, M., aged 43. This patient had suffered from the disease for two years, and practically all the joints of his body had been affected from time to time.

He had received drugs, spa and radiant heat treatment, with distinct benefit, but the condition had persisted in two or three joints and troubled him greatly.

When examined on the 12th January, 1917, the left ankle was found to be much swollen and very stiff, only the slightest amount of flexion being possible. There was much pain and tenderness of the left mid-tarsal joint, and metatarso-phalangeal joints generally, and patien could walk only with great difficulty. The right elbow was swollen and stiff, and could not be extended beyond 140 degrees. The right wrist was swollen, tender and painful. Some slight grating was elicited on movement, which was much restricted.

The patient was given a six weeks' course of radium emanation solution in January and February. He was advised the use of hot salt packs to the affected joints, and told to have some badly-decayed teeth in his upper jaw extracted. Improvement was slow, but steady and uninterrupted, and when patient was last seen in October, 1917, he was able to walk well.

All pain and tenderness of the affected joints had disappeared, the range of movement of his right wrist was normal, though there was still some limitation of extension of the right elbow. He was in excellent general health, and had resumed his work as a machinist.

No further treatment has been necessary.

Case No. 2327, F., aged 26. The patient had suffered from the disease for six months when she presented herself for treatment on the 4th January, 1917. It had proved very irresponsive to the ordinary medical treatment. When examined the condition was found to be of very extensive distribution. The right wrist was swollen and stiff, and could not be flexed beyond 140 degrees. The right elbow was also much swollen, and could not be extended beyond 140°. The left hand showed much peri-articular swelling of the proximal inter-phalangeal joints of the first and third fingers. The left elbow was swollen and stiff, and could not be extended beyond 130°. The movements of the left shoulder joint were limited and painful, though there was no actual swelling of the joint. The right ankle was greatly swollen and very stiff—almost ankylosed. Both knees were swollen and puffy. Voluntary movements were very painful, but passive movements could be performed to the full extent. There was some stiffness of the upper cervical vertebræ and of the left temporo-maxillary articulation.

The patient was given two six-weeks' courses of radium emanation solution in January-February and April-May, 1917.

She was examined on the 3rd July, 1917. The improvement was remarkable. Practically all swelling and stiffness had disappeared. She had resumed her work as a stenographer, could cycle with ease, and walk fairly well, though slowly. Her general health was better in every way.

No further treatment has been necessary.

I desire to express my great indebtedness to my colleague Dr. J. E. A. Lynham, for much generous and valuable help in the compilation of this report.

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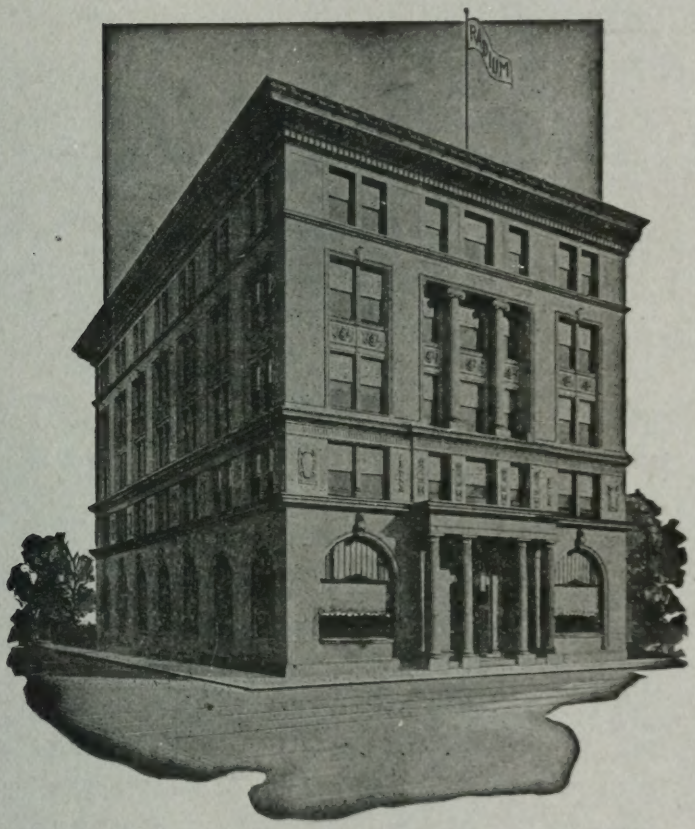

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RADIUM CHEMICAL COMPANY

GENERAL OFFICES AND LABORATORIES

Pittsburgh, Pa.

New York
501 Fifth Avenue.

Boston
Little Building.

Chicago
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43 Parker Street, Kingsway, W. C. 2.